Mechanical and Energy Engineering Department
Senior Design Projects

2019-2020
T2191-T2192

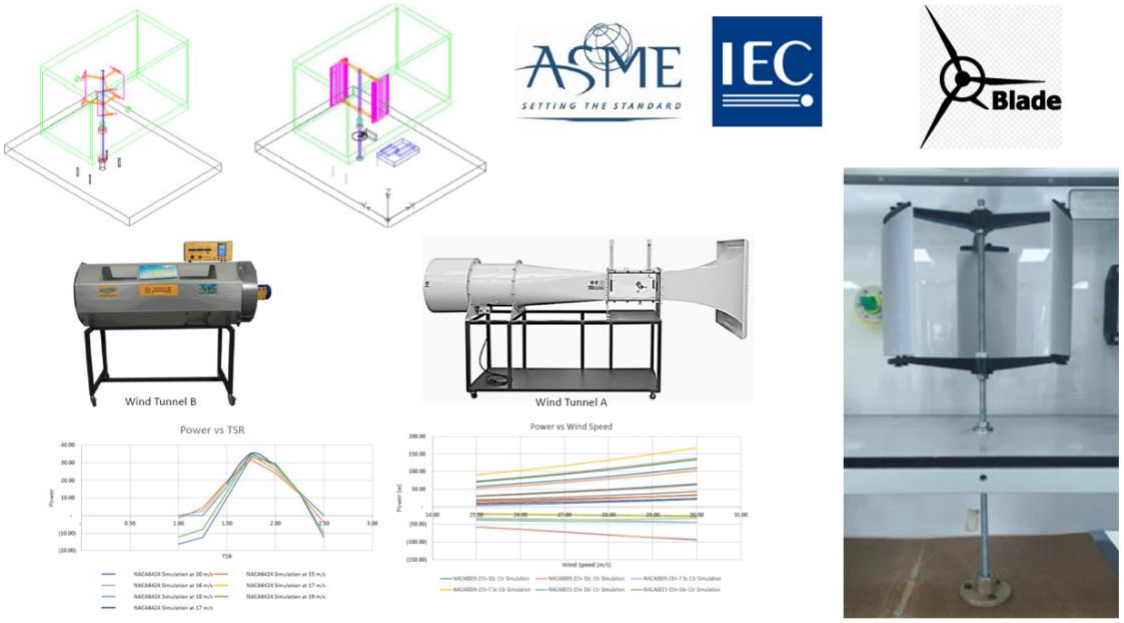
Design, Build and Wind Tunnel Qualification Testing of a Vertical Axis Wind Turbine Model Test Rig.

Students: Abdulrahman Hamdy Elsharqawy; Abdullah Mohammed Baradie; and Moemen Al nomery

Advisor: Dr. Farooq Saeed

ABSTRACT

The proposed study aims at establishing a test setup for Vertical Axis Wind Turbines (VAWT) making use of the existing wind tunnel facility available at the Mechanical and Energy Engineering Department, College of Engineering, IAU. The project will involve the design of both the test setup as well as necessary state-of-the-art instrumentations required to evaluate the performance of small-scale VAWTs and will pave way for proof of-concept tests of various design enhancement ideas such as variable pitch. The test setup will then be built utilizing precision instrumentation especially considering the small size of VAWTs that can be tested for performance evaluation. In addition to the performance evaluation of different concepts, the test setup model will be used to develop and validate existing in-house numerical models for performance evaluation of novel VAWT concepts.



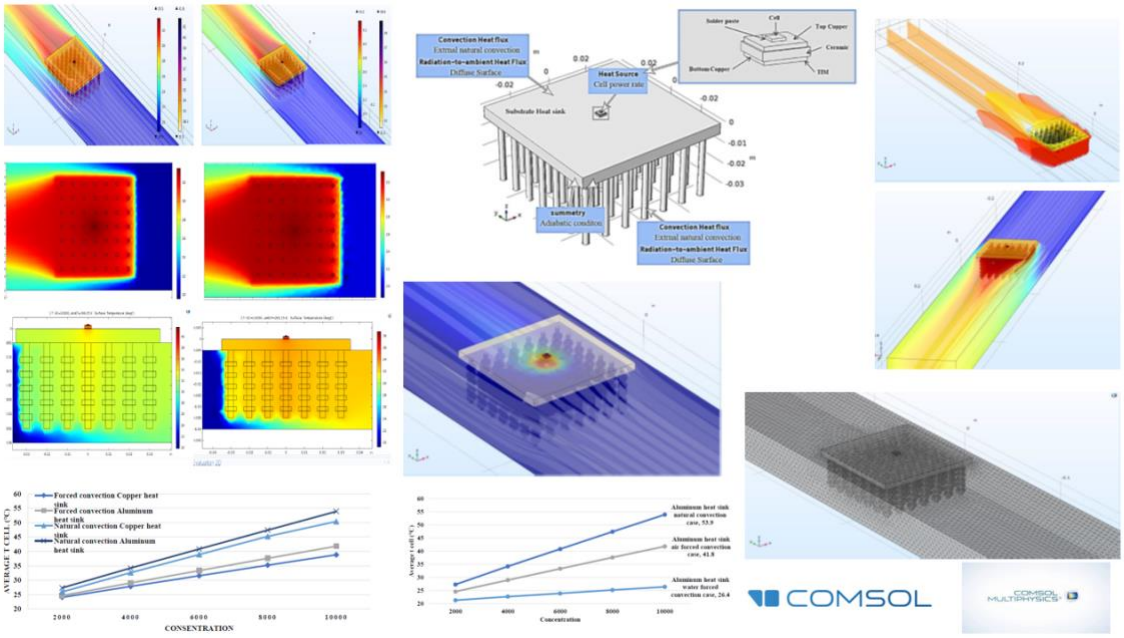
Optimization of the Overall efficiency of Ultra-High- Concentrating Photovoltaic modules

Students: Fahad Alghamdi, and Anas Ali Alshahrani

Advisor: Dr. Taher Maatallah

ABSTRACT

The aim of this study is to optimize and analyze the feasibility and the technical potentials of a new micro pin-fins heat sink of an Ultra-High Concentrating Photovoltaic system of concentration ratio ranging between 2000 to 10000 suns. At first, a flat-plate heat sink is thermally investigated to validate the developed heat transfer model and then introduce the new pin-fins configurations under free and forced convective heat transfer models and with different flow fluids that have never been investigated up to date for such a concentration level according to the authors' knowledge.



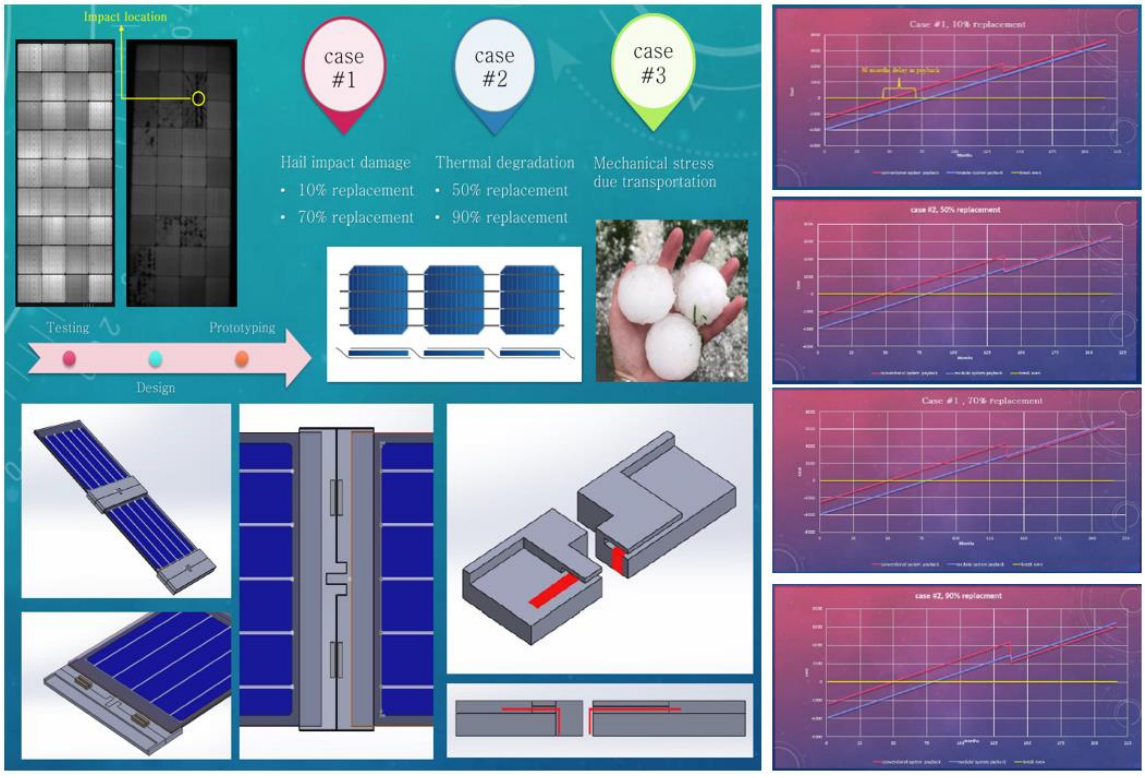
Fundamental Investigation Related to The Development of Repair Methodology for Solar Cells

Students: Abdulrhman Majdi; Mohammed Alqhtaniy; and Abdulmailk Almakhaytah

Advisor: Dr. Mohammed Saleem

ABSTRACT

The entire solar industry is focused on producing cheaper and cheaper solar energy at the cost of compromises in terms of reparability and reusability. All solar panels in the world are manufactured without considering repairability, which leads to producing huge amounts of solar waste increasing the e-waste in the future. As the solar market is growing, repairability of solar panels is becoming more important. In this thesis we are trying to support solar panels repairability and reusability by presenting a new novel modular solar panel that has costs benefit and can be used in practical applications. The new modular design or solar panels considers repairability factor by assisting impact damage that solar panels are subject to. In addition to reducing waste produced by replacing damaged modules with the lowest cost possible.



Design of PV maximum Power point tracker using fuzzy logic control

Students: Saud Khalid Al-Dossary; Ibrahim Sameer Al-Nassir; and Nawaf Mansour Bal-Harith

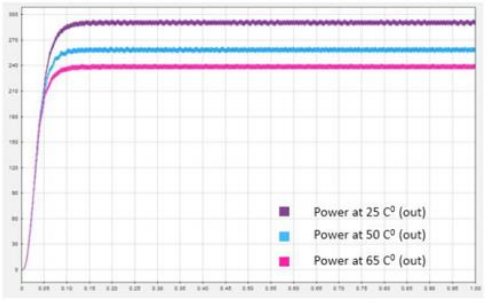
Advisor: Dr. Nagmedeen Hassanian

ABSTRACT

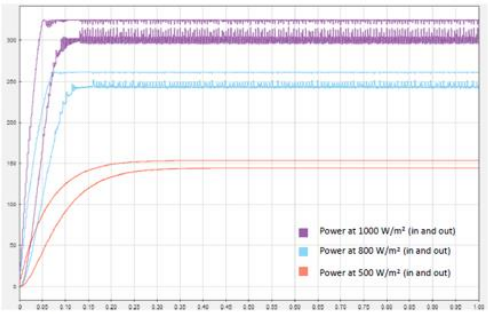
Solar energy production is highly affected by the weather change. A smart algorithm based on fuzzy logic is developed to monitor the photovoltaic (PV) panel's maximum power point (MPP). Simulation steps of the PV panel are performed using the MATLAB/ Simulink setting for tracking the power behavior by use of MPPT algorithm of fuzzy logic.

Photovoltaic (PV) systems have gained significant attention recently due to their efficient solution and reduced costs. PV systems have benefits such as being a renewable source of energy, being supported by design and providing electricity wherever sunlight is available.

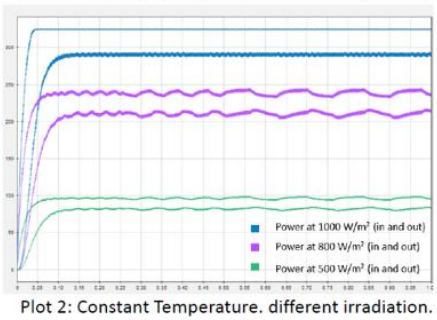
However, Temperature, Irradiation and weather changes effect the power output of the solar panel. In order to maintain the highest output from the panel and reduce the cost of the PV network, solar network should run at MPP (Maximum Power Point) by the adjustments of the voltage and current.



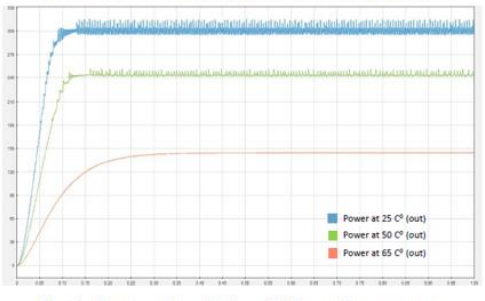
Plot 1: Constant irradiation. different Temperature.



Plot 3: Constant Temperature. different irradiation.



Plot 2: Constant Temperature. different irradiation.



Plot 4: Constant irradiation. Different Temperature.

PROTEUS MATLAB ARDUINO

Cooling Techniques for PV system

Students: Mohammed Alzahrani; and Mohammed Abulebda

Advisor: Dr. Fahd Al-Amri

ABSTRACT

Nowadays, Photovoltaic (PV) is an established technology and it is widely used in various applications. The installation of PV technology faces many obstacles, such as the high temperature which cause an overheating that could have a significant impact on the solar panel efficiency and reduce the amount of electricity supplied. In this project, a feasible cooling technique module for the PV panel will be developed in order to increase the electrical performance of PV.

In our project, we are trying to reduce heat by using the air-cooled heat sink. Firstly, we designed a model to cool the solar panel then we are theoretically analysis the heat sink with different thicknesses of the fin, length of the fin, materials of heat sink, and materials of the solar panel. After that, we did a parametric study for our model and then validate it with other scientific papers. Also, we applied our model in different wind conditions in Dammam City.